

# CONSERVATION SCIENCE ACTION PLAN

## Overview

CINMS staff prioritized conservation science as one of the Sanctuary's primary programmatic functions. This function is driven by the NMSA, which states that the purpose and policy of the NMSA is "to support, promote, and coordinate scientific research on, and long-term monitoring of, the resources of these marine areas" (16 U.S.C. 1431(b)(5)). The mission of the National Marine Sanctuary Program (NMSP) is "to serve as trustee for the nation's marine protected areas to conserve, protect and enhance the biodiversity, ecological integrity, and cultural legacy of these ecosystems." Accomplishing this mission requires a rigorous, objective, scientific foundation for understanding ecosystem structure and function, evaluating the status of Sanctuary resources, understanding socioeconomic impacts, and implementing effective, sustainable, and adaptive management strategies (Gittings *et al.* 2003). CINMS research and monitoring efforts focus on the development and application of a program to support this scientific foundation. The purpose of the research department at CINMS is to support management decision making with conservation science. Site staff and their partners work to better understand such issues as:

- How do biological communities function and vary naturally?
- How do different biological components interact and how are they integral to the health of the ecosystem?
- What are the effects of human activities on the natural system?
- How do ecosystems vary over time due to natural perturbations and anthropogenic factors?
- What socioeconomic impacts result from the health of the ecosystem or from management actions?

Answering these questions allows CINMS to better understand Sanctuary ecosystems, the effects of human use impacts on Sanctuary resources, and the socioeconomic effects of Sanctuary management.

The Sanctuary engages in research mainly through partnerships with government agencies, universities, and private and non-profit institutions. CINMS provides vessel time, staff and field help, divers, and funding to projects that are compatible with the Sanctuary mission.

## Description of the Issues

During the 1999 scoping meetings, a number of specific issues emerged in association with the general issue of science. Several of these specific issues were then designated by CINMS staff and the Advisory Council as areas the Sanctuary should address in the draft management plan:

- The Sanctuary should implement and support more research projects and opportunities;
- The Sanctuary should better interpret and summarize research findings for decision makers and public understanding;
- The Sanctuary should coordinate and cooperate with other regional science organizations;
- The Sanctuary should work to characterize and inventory Sanctuary species and habitat types, assess ecosystem health, and examine natural fluctuations vs. human impacts;
- The Sanctuary should include the participation of commercial fishermen in its scientific research projects; and
- The Sanctuary should always try to base decision-making on scientific information.

Conservation science will be applied at CINMS to help management better understand potential threats to Sanctuary resources. A summary list of management issues, many of which are described in the Resource Protection Action Plan, will be informed by the variety of research, monitoring, and evaluation work embodied in the Conservation Action Plan. These issues include:

- Spatial human use patterns;
- Introduced species;
- Anthropogenic noise;
- Aquaculture;
- Energy development;
- Artificial reefs;
- Climate change effects;
- Marine mammal ship strikes;
- Water quality;
- Efficacy of marine reserves and conservation areas; and
- Socioeconomic effects of marine reserves and conservation areas.

### Addressing the Issues – Strategies For This Action Plan

Currently, CINMS is building a research program that complements the NMSP's national research priorities by focusing its data collection efforts in the areas of ecosystem assessment, monitoring, and processes. Continuing development of research projects in these three areas will help CINMS continue to



**Figure 36.** Sonar equipment is frequently used to map the seafloor (CINMS)

build strong foundations of sound science on which to base management decisions. These foundations also allow CINMS to identify gaps in knowledge about the resources to better identify future research needs and to address increasingly complex resource management issues. This information will be used to develop new strategies to protect Sanctuary resources, restore impaired ecosystem

structure and functioning, and mitigate threats to ecosystem health.

Three types of research projects provide information for CINMS management:

1. Intramural research projects funded by the NMSP and conducted by CINMS staff;
2. Extramural research projects funded and conducted by outside agencies and institutions; and
3. Directed research projects carried out by outside agencies and institutions with guidance and/or support from CINMS and NMSP headquarters.

In addition to data collection efforts, CINMS has a lead role in the community to identify research needs; to collaborate and coordinate research efforts between agencies and institutions; to analyze and disseminate data; and to identify practical management applications for existing data.

There are eight non-regulatory management strategies in this Conservation Science (CS) action plan:

- CS.1 – Sanctuary Aerial Monitoring and Spatial Analysis Program;
- CS.2 – Comprehensive Data Management;
- CS.3 – Support Monitoring and Site Characterization Programs;
- CS.4 – Collaborative Marine Research Project;
- CS.5 – Research Interpretation;
- CS.6 – Biological Monitoring of MPA Network;
- CS.7 – Socioeconomic Monitoring of MPA Network; and
- CS.8 – Automated Identification System (AIS) Vessel Tracking

Each of these strategies is detailed below.

## STRATEGY CS.1 – SANCTUARY AERIAL MONITORING AND SPATIAL ANALYSIS PROGRAM (SAMSAP)

- Objective: To analyze historical data and create predictive models for resource management through near real-time data collection.
- Implementation: Research and Monitoring staff

### **Background**

SAMSAP is an aerial survey program the Sanctuary utilizes for vessel traffic monitoring, marine mammal sighting, and emergency response. These efforts help address management questions about who is using the Sanctuary and how, as well as about the distribution, abundance, and types of marine mammals using the Sanctuary. Sanctuary staff conduct SAMSAP surveys aboard survey aircraft, flying along survey transects that traverse the Sanctuary from Santa Barbara Island to San Miguel Island. During the surveys a specially trained observer notes the location and types of vessels and marine mammals they observe, while a recorder enters this data into a computer system using specially designed SAMSAP software. SAMSAP allows near real-time collection and viewing of data vital to Sanctuary management and resource protection. CINMS will continue mission flights to maintain a statistically significant database to better analyze historical data and create predictive models for resource management. Data are shared with research partners and summaries are made available to the public using the CINMS comprehensive data management strategy.

### **Activities (2)**

**(1) Continue SAMSAP Data Collection.** To collect statistically reliable data on vessel traffic and marine mammal sightings, aerial surveys need to take place on a weekly basis. A basic survey mission (vessel or marine mammal survey) consists of a recorder entering specific coordinates and species or vessel type specific information into the survey program. After completion, the survey file is converted to GIS data, which are then classified and displayed over a base map. Other data layers, such as sea surface temperature, may be added to allow queries across data types. Data are comparatively analyzed with other sampled physical and anthropogenic phenomena to observe trends, correlations, and variations. Animations of historic data are created to aid in the visualization of visitor use and marine mammal migration patterns over variable time frames. In addition to the data collection efforts, SAMSAP is being used as a response tool for resource emergencies such as oil spills. Data collected on spill perimeter changes, spill trajectories, observed oil, and endangered animals can be downloaded in real-time directly from the aircraft to a portable GIS at Unified Command Centers to aid in both immediate response decisions and long-term impact analysis.

Status: Ongoing since 1998, will continue multiple flights per week as weather and aircraft readiness permits

Partners: NOAA Marine and Aviation Operations

**(2) Produce Data and Trends Analysis.** Data collected from the vessel traffic surveys will help assist the Sanctuary in understanding levels and types of visitor use (both recreational and commercial) taking place in Sanctuary waters. These data are essential for understanding visitor impacts on marine resources and making sound management decisions. Marine mammal data will provide valuable information on migration patterns to better understand seasonal use of Sanctuary waters by cetaceans and pinnipeds. Data will be made available to scientists and decision-makers for predictive modeling, and to the public for viewing.

Status: Data collection since 1998; SAMSAP data analysis ongoing

Partners: Internal only



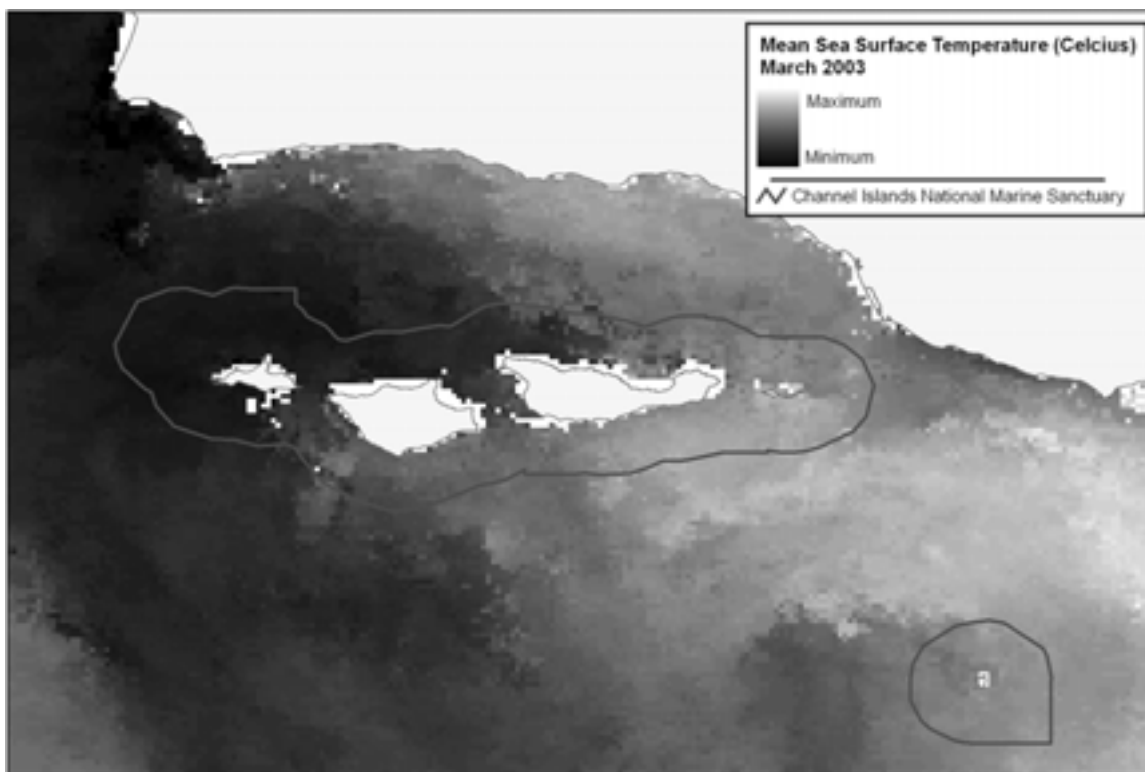
***Figure 37.*** Using NOAA aircraft or contracted aircraft resources is integral to the SAMSAP program. (CINMS)

## STRATEGY CS.2 – COMPREHENSIVE DATA MANAGEMENT

- *Objective:* To integrate CINMS data into existing regional and national data management programs that will facilitate conservation science-based decision-making.
- *Implementation:* Research and Monitoring staff

### *Background*

Combining CINMS' existing infrastructure capacity with regional and national partners, the Sanctuary will develop a strategy for integrating, processing, synthesizing and analyzing a large volume of Sanctuary data. This strategy will initially focus on spatial data; however, CINMS will work to incorporate data spanning the variety of Sanctuary programs. For example, the system may include ecological, management, and historical resource data, as well as data on education and outreach projects. To maximize the utility of such a strategy, CINMS will ensure that the distribution node provides an intuitive user interface. The interface will be web-based, and will be made available for practical



*Figure 38. GIS imagery of CINMS*

application by both a casual user and experts.

The objective of comprehensive data management is to develop a well-designed information management and dissemination tool to facilitate conservation science-based decision-making. Regional partners, such as the University of California, Santa Barbara's Marine Science Institute, have well developed infrastructure for such an endeavor (e.g., "Marine Map"). Through data partnerships, CINMS will be able

to disseminate data using well established data distribution nodes. This will eliminate duplication of effort, save time and resources at CINMS, and support partners by providing the data useful to them and to the public. Additionally, CINMS will utilize the Sanctuary Integrated Monitoring (SIMoN) system to further provide easily accessible links to geospatial and other data created by CINMS. By collaborating with regional and national partners, CINMS will expand the range and uses of existing Sanctuary data.

## ***Activities (2)***

***(1) Identify Applicable Data Nodes.*** CINMS will contact regional partners already running established web-based data warehouses and identify the appropriate data warehouses to best disseminate particular data types.

*Status:* Implement by year 2

*Partners:* SIMoN, NMSP Headquarters, UCSB

***(2) Process and Maintain Existing and New Data.*** CINMS will continue current research programs involving data collection on natural and anthropogenic phenomena in the Sanctuary. CINMS will also ensure that data sets are kept up to date with current metadata. To enhance the resource management value of these programs, remotely-sensed satellite (*e.g.*, sea surface temperature), aerial (*i.e.*, SAMSAP), and habitat characterization (*e.g.*, sidescan sonar of benthic habitat) data will be integrated into existing and future research as well as current GIS programs to increase the Sanctuary's ability to carry out complex spatial analyses. All spatial data will be standardized according to National Spatial Data Infrastructure format.

*Status:* Ongoing

*Partners:* Internal only

## STRATEGY CS.3 – SUPPORT MONITORING AND SITE CHARACTERIZATION PROGRAMS

- Objective: To support monitoring programs and build a database of Sanctuary resources.
- Implementation: Research and Monitoring staff

### **Background**

CINMS will continue to work with and develop programs to understand habitats, species abundance, diversity, ecological processes, links with abiotic processes (*e.g.*, climate and physical oceanography), interactions with natural and human disturbance, and general resource protection issues. A baseline inventory is necessary to determine change over time; effectiveness of resource protection efforts; the effects of human activities on natural systems, and socioeconomic information on the use, scenic and existence value of resource conservation.

CINMS also strives to achieve a system-wide ecosystem monitoring program to track structural, functional, biological, chemical and physical conditions of natural marine resources over long periods of time to identify changes resulting from anthropogenic and/or natural disturbance. There are a variety of ecosystem monitoring efforts focused on important management issues, both current and emerging. Based on information from these monitoring programs, actions may be taken to address adverse impacts in order to more effectively conserve, enhance and restore habitats and ecosystems. Moreover, information from monitoring programs may indicate more effort is needed in assessing a particular aspect of the ecosystem. For example, several monitoring programs track disease and pollution, non-indigenous species, and bioprospecting as part of their regular monitoring activities. In this way, conservation science and evaluation of current and emerging issues are closely linked. As part of adaptive management, our research and monitoring program is ready to respond to current and emerging issues and changing priorities. Within the broad outline of this strategy, new research projects and partnerships may develop within the next five years in response to current and emerging issues or resource protection. Research priorities are evaluated on an annual basis.

Among these various monitoring efforts, the Sanctuary's role is to actively coordinate and support research efforts of other agencies and institutions, provide platform and personnel support for research conducted by CINMS and other agencies, and synthesize existing information to better identify data gaps and information needs. In addition, CINMS will work with partners to develop a methodology for intuitive data query to be used by resource managers (as well as educators and the public) through web-based access (see Strategy CS.2). The following site characterization and monitoring activities are "directed" research projects conducted by others with guidance and/or support from CINMS and NMSP headquarters

### **Activities (4)**

**(1) Continue Support for Monitoring.** Monitoring of biological resources is needed to evaluate the condition of resources over time. Monitoring projects are regularly conducted efforts that revisit the same areas over time and use standardized protocols for the purpose of recording the status of a resource. CINMS supports several monitoring projects that evaluate habitat, species, and physical conditions. Several of these are listed below.

- **Kelp Forest Monitoring** – Since 1981, the NPS has monitored 16 sites in CINMS and Channel Islands National Park on a regular basis. These sixteen sites were selected to represent a range of biogeographical and physical settings of kelp forests in the CINP and CINMS. In 2004,



another 16 sites were added to pair sites inside and outside of state marine reserves for marine reserves monitoring. CINMS has provided vessel support for the program, and staff assist with CINP sampling schemes which include quadrants, band transects, random point contacts, visual fish transects, size frequency surveys, thermographs, video surveys, photogrammetric plots, and species inventory surveys. These data indicate temporal trends for 68 kelp forest taxa at 32 sites. Data also reveal differences in abundance of benthic organisms at different locations. This project is one of the longest ongoing data collection efforts in Sanctuary waters, providing data on one of the Sanctuary's unique and prolific habitats and CINMS is committed to supporting its continued operation.

Status: Kelp forest monitoring in continuous operation by CINP since 1981; Sanctuary support and involvement to continue through years 1-5, and beyond

Partners: Channel Islands National Park

- Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) – PISCO is a consortium of researchers at universities along the West Coast of the US. PISCO researchers at UCSB have been studying the Channel Islands since 1999. PISCO monitors fish and invertebrate density in kelp forest communities on SCUBA surveys inside and outside marine reserves. PISCO has three components: (1) subtidal monitoring (2) recruitment (3) oceanographic monitoring. The PISCO scientists collect data in a coordinated program that facilitates comparisons of marine biological communities and oceanographic conditions from Washington State to the southern border of California. Data is available line at:  
<http://www.piscoweb.org/research/community/subtidal/sitemap#>.

Status: PISCO surveys and research conducted since 1999; Sanctuary support and involvement to continue through years 1-5, and beyond

Partners: PISCO

- Acoustic monitoring – Acoustic monitoring is conducted by Dr. John Hildebrand and his graduate students from Scripps Institution of Oceanography. The goals of their research program are to 1) understand the anthropogenic noise in the Santa Barbara Channel and Sanctuary using in-situ listening devices, 2) Relate the anthropogenic noise to ship traffic by integrating acoustic data with data on ship traffic from Automated Identification Systems on ships which is transmitted from large ships to various receivers including at Santa Barbara Harbor and UCSB, 3) understand the abundance, distribution, and vocalizations of marine mammals in the channel and Sanctuary, 4) understand how anthropogenic noise affects the behavior of marine mammals. Beginning in 2005, the scientists deployed equipment in the channel and in 2007 received additional funding for more equipment from NOAA. The Sanctuary assists by providing vessel time, field scientists, and community outreach. Dr. Hildebrand's work is a step toward addressing Sanctuary Advisory Council acoustic sources and impacts recommendations 1 (initiate Sanctuary-wide noise monitoring) and 3 (study anthropogenic noise impacts on Sanctuary ecology).

Status: Scripps researchers conducting research in the Santa Barbara Channel and Sanctuary since 2005; Sanctuary support and involvement to continue through years 1-5, and beyond

Partners: Scripps Institution of Oceanography, NOAA Ocean Acoustics Program

- Deep Water Monitoring – Following recommendations made in a 2005 workshop and the establishment of MPAs in federal waters in 2007, a proposal to characterize and monitor deep water habitat, communities, and populations was developed by West Coast sanctuary staff. The proposal calls for habitat mapping and characterization, and monitoring of biodiversity,

ecosystem health, invasive species, and other key species, identifying stressors, and understanding how extraction affects the ecosystem. Provided adequate resources can be obtained, a range of habitats and locations will be selected and monitored over time and will constitute a comprehensive survey of the community, including rare and common species. Activities in this proposal will allow the Sanctuary to leverage resources by incorporating ongoing projects, such as habitat mapping by USGS, while collaborating with partners on contemporary technologies such as submersibles, remote sense data, and technologically advanced diving methods. Further development of the proposal into an implemented plan is necessary (see Strategy CS.6). Given the significantly high cost of deep water monitoring, it will be important for CINMS and the NMSP to seek and leverage as much support as possible from other NOAA offices that are implementing potentially relevant projects. Proposed activities are inclusive of and complementary to CS.3, activity 4 (site characterization – see below) and CS.6 (Biological Monitoring of MPA Network).

Status: Workshop held in 2005, proposal development in 2008, plan implementation in years 2-5

Partners: NMSP Headquarters, USGS, NMFS, MBARI, EPA; Monterey Bay, Gulf of the Farallones, and Cordell Bank national marine sanctuaries

**(2) Continue Seafloor Mapping Project.** Since 1997, CINMS and the U.S. Geological Survey have conducted an ongoing survey to characterize benthic habitats in and around the waters of CINMS.<sup>30</sup> This research is designed to identify and link different habitat types and their associated biological communities. With NOAA vessels as launch platforms, side scan sonar has been and will continue to be used to ground truth sensor imagery of bottom types and bring a finer resolution to Sanctuary bathymetric maps. In addition, ROVs, submersibles, and cameras have been and will be used to ground truth the side scan sonar findings. With about 20 percent of the high-quality data mapping complete in Sanctuary waters, it is estimated it will take an additional 10 years to map the remainder. To complete seafloor mapping and site characterization of the CINMS, Sanctuary staff will continue to work closely with the U.S. Geological Survey, MMS, and other groups.

Status: Surveys ongoing since 1997; work planned to continue until mapping complete

Partners: U.S. Geological Survey and other experts

**(3) Continue Support for Seabird Studies.** Through nest searches, nocturnal spotlight surveys, captures, and other monitoring techniques, baseline seabird population data are being collected in the Sanctuary to obtain several measures of population status. These data will be used to compare future data to help measure changes in seabird populations. For example, since eradication of black rats on Anacapa Island in 2002, researchers have documented an increase in Xantus's murrelet nesting and nest success. CINMS supports seabird research, including Xantus's murrelets, Ashy Storm petrels, Cassin's auklets, and others using the CINMS vessel as a platform, and staff participation.

Status: Xantus's murrelet annual surveys ongoing since 2000 and planned to continue as needed, Ashy storm-petrels since 1995, CINMS support of Cassin's auklets since 2007

Partners: Humboldt state University; U.S. Geological Survey; Channel Islands National Park; Point Reyes Bird Observatory; U.S. Navy; U.S. Fish and Wildlife Service; American Trader Trustee Council (ATTC); CA Dept. of Fish and Game; Minerals Management Service, California Institute of Environmental Studies

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<sup>30</sup> Much of the U.S. Geological Survey research within the Sanctuary has been funded by MMS.

**(4) Support Site Characterization Research Projects.** The Sanctuary supports projects to characterize features and resources of the Sanctuary. These include projects to characterize the physical features, kelp coverage, fish and invertebrates, and water quality, among others. As additional Sanctuary-based research proposals are received, CINMS will consider supporting select projects to assist in gaining a better understanding of living marine resources, ecosystems and human activities. As appropriate, CINMS will provide staff, vessel time or other support to these projects. Research priorities are evaluated on an annual basis, allowing for the inclusion of projects addressing emerging issues (see Strategy RP.2).

Status: Ongoing activity since site designation, support of select research projects to continue through years 1-5

Partners: Various researchers

**(5) Develop a Carbon Budget for the Sanctuary.** CINMS staff, with input from Sanctuary Advisory Council members, have developed a proposal for a pilot project to characterize the human carbon inputs to the Sanctuary. This pilot project is intended to be a component of a larger project to estimate a net carbon budget for the CINMS. This project will have a number of valuable dividends, but is principally designed to inform more environmentally responsible recreational, commercial and research use of the CINMS resource. Involved CINMS community members will deploy a fuel consumption and use monitoring program. Data from the Santa Barbara County Air Pollution Control District and California Air Resources Board will be collected to establish baseline reference levels and estimates of impacts for given levels of fuel consumption. CINMS staff will also analyze large ship data to predict large commercial CO<sub>2</sub>, sulfur and nitrogen inputs to the CINMS domain. These values can be assembled to produce monthly estimates, which in turn may be used to develop quarterly and annual summaries that can be provided to the Sanctuary Advisory Council to monitor progress. In parallel, CINMS staff will work with the research community to develop other modules of the larger Carbon Budget for the CINMS into which the human impacts module will fit. The larger Carbon Budget will form the research framework onto which diverse current research can be integrated into larger-scale, ecosystem assessments.

Status: Development of proposal and pilot project in 2008

Partners: Sanctuary Advisory Council, various researchers and carbon budget experts

## STRATEGY CS.4 – COLLABORATIVE MARINE RESEARCH PROJECT

- Objective: To foster research collaboration among scientists, various agencies and fishers and to obtain rigorous scientific data on issues of concern to these groups.
- Implementation: Research and Monitoring staff, Channel Islands Marine Sanctuary Foundation

### ***Background***

This strategy seeks to develop a program fostering collaboration among scientists, various agencies and fishers to promote cooperative research, resource assessment and protection with stakeholders who have experience and knowledge of the marine environment. The program is based on a partnership of local marine researchers, conservation organizations, commercial and recreational fishers and regional resource management agencies. It is designed to simultaneously collect resource management information in a cost-effective manner, build working relations between marine stakeholders and provide additional income to participating fishers.

Collaborative Marine Research Project partners will work together to prioritize resource management issues and questions and use these to select and design research projects. The data collected from these projects will help direct resource management efforts in the northern SCB. Efforts will be made to ensure this program does not duplicate existing research efforts, but rather complements them by filling research gaps and building new knowledge to assist resource managers in the decision making process.

### ***Activities (1)***

***(1) Select and Implement Research Projects.*** A planning committee with representatives from participating agencies organizations and institutions will solicit research projects. The committee will also seek outside funding for additional program support. CINMS staff track progress and receive reports from projects.

Status: Pilot projects selected and funded in 2001/2002; two collaborative research projects were selected and funded in 2005 and conducted in 2006; Sanctuary support to continue through years 1-5 as funding allows

Partners: CA Dept. of Fish and Game; NOAA Fisheries; Channel Islands National Park; UC Santa Barbara; UC Sea Grant; commercial and recreational fishermen; The Ocean Conservancy; Channel Islands Marine Sanctuary Foundation

## STRATEGY CS.5 – RESEARCH INTERPRETATION

- *Objective:* To communicate and interpret for the public, NOAA, the scientific community, and other resource managers, the research activities taking place in and around the Sanctuary.
- *Implementation:* Research and Monitoring, and Education and Outreach staff

### **Background**

CINMS communicates and interprets for the public, NOAA, the scientific community, and other resource managers the research and monitoring activities taking place in and around Sanctuary waters. A successful interpretation and outreach program ensures an ongoing and open dialogue among scientists, managers and the public. Outreach leads to a better understanding of Sanctuary resources and their value and, ultimately, to more informed participation in resource management decision-making and ocean conservation. As an offshore site, CINMS needs to reach out to the regional community to make a connection between their activities on land and in and on the water and how this impacts the marine environment. Fundamental to this effort is helping the public learn about the value of the natural ecosystem, how human activities affect it and the connection between a healthy economy and a healthy ecosystem.

One model for successful monitoring program outreach is the Sanctuary Integrated Monitoring Network (SIMoN) system, a center for initiating and integrating data collecting efforts and for disseminating information ([www.mbnms-simon.org](http://www.mbnms-simon.org)). First implemented at the Monterey Bay National Marine Sanctuary in 2002, SIMoN uses a comprehensive website and database system to help researchers integrate existing monitoring programs and identify gaps in information. As a communication and data discovery tool, SIMoN helps the research community to avoid duplication of efforts so resources can be more effectively directed towards surveying and characterizing habitats, assessing the impact of natural processes or human activities on specific resources, and long-term monitoring. Through a web site, reports, newsletters and symposiums, SIMoN also serves to make monitoring data available to managers, decision makers, the research community, and the general public. The NMSP is seeking to expand SIMoN from the Monterey area to regions further north and south, specifically including the CINMS. Sanctuary staff plan to work closely with SIMoN staff and regional scientists to build and maintain SIMoN for CINMS.

### **Activities (4)**

**(1) Interpret and Disseminate Sanctuary Research Findings.** CINMS works closely with the scientific community to distribute scientific information, identify information gaps, coordinate and disseminate data, and interpret research generated by the scientific community for public consumption. A key component of this activity will be the development and maintenance of a Sanctuary Integrated Monitoring Network (SIMoN), as described above, and similar to the system already in place at the Monterey Bay National Marine Sanctuary ([www.sanctuariesimon.org](http://www.sanctuariesimon.org)). Another component is the continuation of an annual report summarizing CINMS research projects/results, as has been compiled by Sanctuary staff annually since 2004. The report will be disseminated in bilingual format as appropriate. Beginning in 2007, all sanctuaries will periodically produce a Sanctuary Wide Monitoring (SWiM) report that discusses the condition of the sanctuary. With input from experts, Sanctuary staff will produce the first CINMS SWiM report in year 1.

*Status:* CINMS research department web site offerings upgraded in 2003-2006. Since 2004, Sanctuary staff has assisted coordinating and supporting the Sanctuary Advisory Council's RAP (Research Activities Panel), which in part contributes to disseminating research and monitoring

program findings. Spatial information on projects was compiled in 2006 by UCSB Bren School intern. Research summary to be published annually. SWiM report to be published every five years.

Partners: Sanctuary Advisory Council, Research Activities Panel, UCSB, NOAA NMSP

**(2) Develop a Research-Focused Website and Implement SIMoN.** The website, to include SIMoN, will serve as a portal to various research and monitoring results, data, maps, publications and other materials for researchers and the public.

Status: CINMS research web site significantly upgraded in 2003-2006, maintenance and updated postings continue; SIMoN website developed by the end of year four

Partners: SIMoN, Internal

**(3) Disseminate Research Information at Public Venues.** CINMS will ensure public awareness of Sanctuary research by providing research information, such as that contained in the annual report mentioned in activity (1) above, at meetings, workshops, and lectures. These outreach opportunities enhance communication among the research community, the public and Sanctuary staff while helping to disseminate current research results to the public in a timely fashion. For example, researchers will continue to be invited to present findings at the Shore to Sea lecture series and Sanctuary Advisory Council meetings. CINMS staff will present information at scientific conferences and workshops. In addition, other venues and opportunities will be explored. Materials will be multilingual when appropriate and necessary.

Status: Implement by year 2

Partners: Sanctuary Advisory Council

**(4) Develop a Voluntary Research Registry.** CINMS will develop an outreach program to encourage the regional scientific community, who are conducting research that does not require a Sanctuary permit to inform CINMS of the nature and intent of their research. The voluntary research registry allows CINMS to spatially track research activities, understand the types of research activities being undertaken, and have the Sanctuary benefit from research and monitoring findings from projects the Sanctuary did not directly assist.

Status: Permitted and directed research is currently tracked and reported, extramural research tracking will be implemented by year 2, maintain thereafter

Partners: California Department of Fish and Game; Channel Islands National Park; U.S. Fish and Wildlife Service; NOAA Fisheries; U.S. Coast Guard, UCSB

## STRATEGY CS.6 – BIOLOGICAL MONITORING OF MPA NETWORK

- Objective: To measure the biological effects of the Channel Islands MPA Network.
- Implementation: Research and Monitoring staff

### **Background**

An important part of the long term management of the Channel Islands MPA network are programs to monitor and evaluate biological, social, and economic changes in areas that are within, nearby, and distant from the MPAs. Together, these monitoring programs will help managers determine the impacts and effectiveness of the MPA network. MPAs can act as reference sites, providing useful data on natural populations in the absence of fishing pressure. Much needed data on natural mortality rates, growth rates, population structure, effects of various environmental changes, and other parameters can be obtained. CINMS staff works closely with several partner agencies and institutions to implement biological MPA monitoring programs. The biological monitoring for the nearshore MPAs is guided by the *Channel Islands Marine Protected Areas Monitoring Plan*, released in February 2004 by the California Department of Fish and Game (California Resources Agency, CDFG 2004). This plan calls on the Sanctuary and other agencies and institutions for significant staff, vessel and funding contributions. A deep water MPA monitoring plan is in development and is guided by a deep water MPA network monitoring workshop hosted by NOAA in 2003.

Since the MPAs were designated in 2003 and 2007, several existing research and monitoring programs at CINMS have been modified to include monitoring the network. For research and monitoring activities conducted without Sanctuary support or involvement, CINMS will track external research projects that may aid in the Sanctuary's MPA network monitoring efforts.

On February 7-8, 2008 the California Department of Fish and Game, CINMS, Channel Islands National Park and the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) at the University of California, Santa Barbara sponsored a public symposium on the first five years of monitoring, enforcement and education programs for the Channel Islands Marine Protected Area Network. In general, the findings of these first five years of monitoring show consistent differences in abundance and size of species found within the MPAs versus the surrounding waters, including species that are targeted by fishing, such as kelp bass and California sheephead. Research using a remotely-operated vehicle and SCUBA surveys found targeted finfish species monitored had greater densities within the MPAs than those outside. Other studies noted increases in the average size of fish inside MPAs, which can have important ecological effects because larger fish produce exponentially more young than smaller fish. Preliminary research also indicates that California spiny lobsters found within the MPAs are larger in size and in greater abundance than outside MPAs. Mature large sized lobsters are essential to successful reproduction of this valuable fishery ([www.dfg.ca.gov/marine/channel\\_islands/specialsession.asp](http://www.dfg.ca.gov/marine/channel_islands/specialsession.asp)).

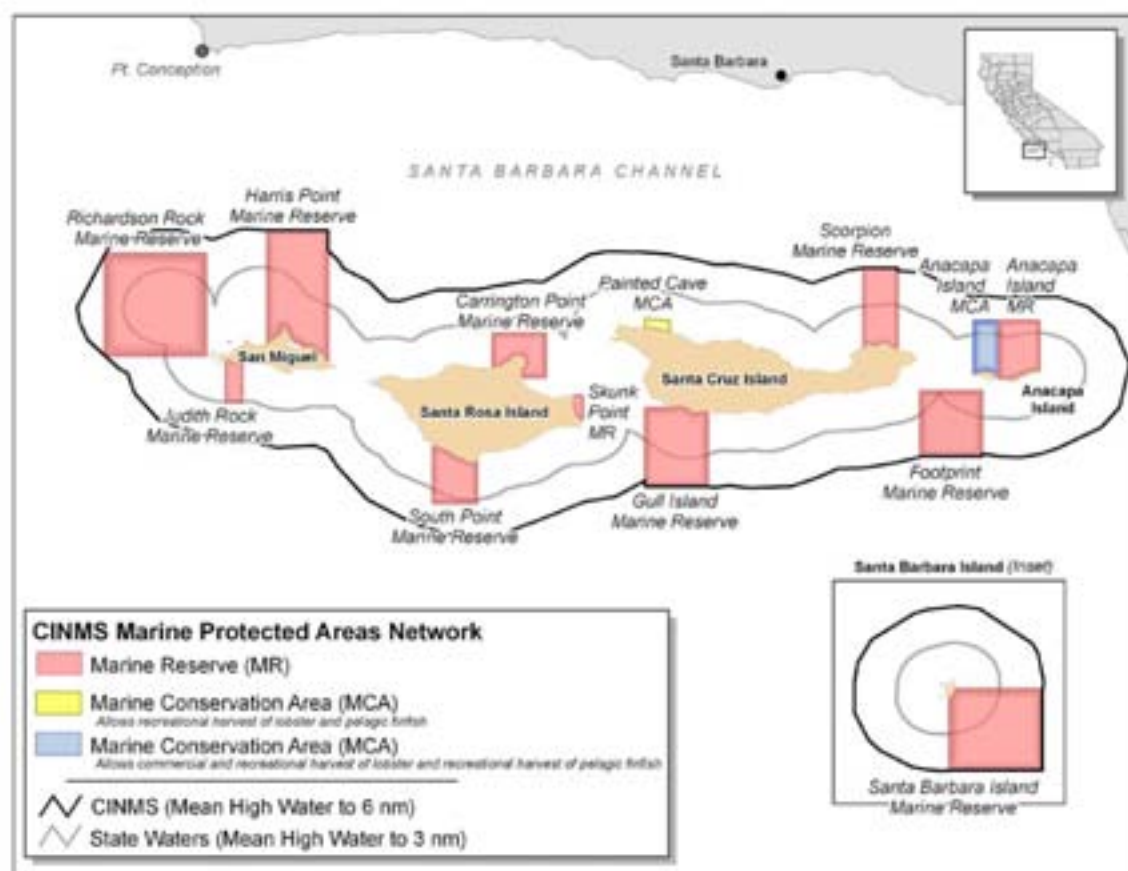


Figure 39. Marine reserves and conservation areas within CINMS (2008)

### Activities (3)

**(1) Maintain and Expand MPA Network Biological Monitoring Program.** CINMS will continue to work closely with the California Department of Fish and Game and other partner agencies and institutions to maintain and further develop biological monitoring programs contributing to evaluating the effectiveness of the MPA network, such as the Remotely Operated Vehicle (ROV) project in partnership with CDFG, Marine Applied Research and Exploration (MARE), and CINMS. This and other existing or envisioned programs are described in the Channel Islands Marine Protected Area Monitoring Plan, a multi-agency document that will be revised periodically to direct highest priority MPA network monitoring projects (California Resources Agency, CDFG 2004).<sup>31</sup> In years one through five, CINMS will, in partnership with other agencies and institutions, conduct, coordinate and support a variety of monitoring activities. The Sanctuary will also participate in periodic symposia and reporting on MPA network effects.

**Status:** Program development, coordination, implementation, and evaluation through years 1-5

**Partners:** California Department of Fish and Game; Sanctuary Advisory Council and Research Activities Panel; National Park Service; NOAA Fisheries; Partnership for Interdisciplinary Study of Coastal Oceans (PISCO); various universities and other experts and organizations

<sup>31</sup> Available online at [http://www.dfg.ca.gov/mrd/channel\\_islands/monitoring.html](http://www.dfg.ca.gov/mrd/channel_islands/monitoring.html).



**(2) Utilize Various Existing CINMS Research and Monitoring Programs In Support of the MPA Network.** Such programs, which are implemented both inside and outside of MPAs, include but are not limited to:

- The Collaborative Marine Research Project (Strategy CS.4);
- Sanctuary Aerial Monitoring and Spatial Analysis Program (Strategy CS.1);
- Habitat Mapping (See Strategy CS.3);
- Seabird Research (See Strategy CS.3); and
- Biological Monitoring (See Strategy CS.3)

Status: (See status previously listed for each strategy referenced above)

Partners: (See partners previously listed for each strategy referenced above)

**(3) Develop and Implement an MPA Network Deep Water Monitoring Plan.** Following recommendations made in a 2005 workshop and the establishment of MPAs within CINMS federal waters in 2007, a proposal to characterize and monitor deep water habitat, communities, and populations was developed by West Coast sanctuary staff in 2008. To be fully implemented, further development of the proposal into a plan is necessary. A key part of this development is coordination and collaboration with partner researchers and agencies. In addition, the challenging logistics of working in deep water habitats require that significant funds are available to fully implement the plan and acquiring these funds are critical to the success of the plan. A general description of the proposed monitoring is available in CS.3, activity (1).

Status: Proposal developed in 2008, further development in years 2-5

Partners: USGS, CDFG, NOAA-IOOS, NOS, Research Activities Panel of the Sanctuary Advisory Council

## STRATEGY CS.7 – SOCIOECONOMIC MONITORING OF MPA NETWORK

- Objective: To demonstrate the socio-economic effects of the Channel Islands MPA network.
- Implementation: Resource Protection staff, and Social Science Coordinator

### **Background**

Under a state and federal partnership, a commitment was made in 2003 to monitor and adaptively manage the MPA network within the Sanctuary. In particular, a commitment was made to monitor biological and socioeconomic changes occurring inside and outside the MPA network, and cooperatively and adaptively manage them. The overall goal of socioeconomic monitoring is to identify MPA network effects on human spatial use of the Sanctuary, economic values, local and regional economic impacts, and the knowledge, attitudes and perceptions of Sanctuary users.

CINMS created a social science plan that details an explicit three-year effort to acquire and analyze scientifically rigorous socioeconomic data on all human uses of the Sanctuary. The CINMS *Social Science Plan for 2007 – 2010, Socioeconomic Research & Monitoring of Marine Reserves and Conservation Areas*, is available online at: [http://channelislands.noaa.gov/marineres/PDF/ssp\\_8-29-07.pdf](http://channelislands.noaa.gov/marineres/PDF/ssp_8-29-07.pdf). Basic information from this plan is described next, followed by an overarching activity for this strategy that focuses on developing and implementing a socioeconomic monitoring program.

The spectrum of human uses to be monitored and understood is categorized as consumptive (*e.g.*, commercial and recreational fishing, spear fishing), non-consumptive (*e.g.*, kayaking, diving), passive (*e.g.*, learning about the Sanctuary through reading), and education and research related (*e.g.*, lectures and exhibits). A strategy for addressing MPA network effects to each of these user groups is included in the social science plan.

Data will be required to address three main objectives: (i) test socioeconomic predictions made prior to MPA network designation, (ii) monitor human-sanctuary interactions to inform adaptive management of the MPA network, and (iii) contribute to an ecosystem-based approach to management.

In 2003, over 100 scientists, agency staff, and stakeholders met at a public workshop to provide formal research and monitoring recommendations. With further input from CINMS stakeholders and scientists, these formal recommendations were used to devise a three-year program of research and monitoring presented in the social science plan, including a strategy for each user group, a consultative process for working with stakeholders, and a process for establishing priorities and allocating funds.

Outline of Recommended Research: Socioeconomic research and monitoring objectives and questions to be addressed are as follows:

1. Commercial Fishing -- Identify and measure the effect, if any, that the MPA network is having on commercial fishing businesses, fishing communities, and economies that benefit from fishing. Do impacts of the MPA network financially harm or benefit individual fishermen/businesses (or have no discernable impact)? Do impacts of the MPA network harm or benefit local and/or regional economies? Are there broader social/community impacts from the MPA network? Will data on spillover/replenishment effects support an integrated assessment?
2. Recreational Fishing -- Identify and measure the effect, if any, that the MPA network is having on recreational fishing businesses, individuals, and economies that benefit from fishing. What are the spatial use patterns and intensity of recreational fishing in the Channel Islands, and how has

this changed since the MPA network was designated? Do impacts of from the MPA network financially harm or benefit individual fishermen/businesses? How do the perceptions of recreational fisherman toward the MPA network affect their spatial use patterns and individual businesses that serve them?

3. Non-Consumptive Use -- Identify and measure the effect, if any, that the MPA network is having on non-consumptive uses such as diving, kayaking, and wildlife viewing. What are the spatial use patterns and intensity of these uses? What are the local expenditures and associated economic impacts on local economies and consumer/producer surplus levels associated with spatial use patterns and intensity? What attitudes, perceptions, and level of knowledge do non-consumptive users have in relation to the CINMS and MPA network? What are the biological and physical attributes of the CINMS that best explain non-consumptive use patterns and associated values? How are such use patterns and associated values likely to change if attributes of the CINMS change?
4. Non-Use -- Identify and measure the effect, if any, that the MPA network is having on values of so-called non-users. Does the MPA network affect existence value, bequest value, and option value?



**Figure 40.** Sea kayakers near Santa Cruz Island (CINMS)

A strategy that defines priorities, differentiates funded from planned activities, and identifies who will be responsible for each activity is defined for each user group.

Priorities and Process for Funds Allocation: The social science plan identifies the order in which activities will be undertaken and the principals used to derive priorities and allocate new funds.

Consultative Process: It is recognized in the social science plan that socioeconomic research and monitoring cannot take place without cooperation from Sanctuary users, and that human surveys are an important tool for collecting spatial use data. A consultative process is presented that defines protocols for interacting with users, sharing information, and, where necessary, keeping user data confidential.

### ***Activities (1)***

***(1) Develop and Implement MPA Network Socioeconomic Monitoring Program.*** CINMS will continue to work closely with NOAA economists, partner agencies and institutions, and Sanctuary users to conduct, coordinate and support socioeconomic monitoring activities in accordance with the CINMS Social Science Plan for 2007 – 2010, Socioeconomic Research & Monitoring of Marine Reserves and Conservation Areas.

Status: CINMS has contracted a Social Science Coordinator annually since 2005, and a 3-year social science plan was finalized in 2007

Partners: NMSP; Sanctuary Advisory Council and Working Groups; National Park Service; California Department of Fish and Game; NOAA Fisheries; various universities and other experts and organizations

## STRATEGY CS.8 – AUTOMATED IDENTIFICATION SYSTEM (AIS) VESSEL TRACKING

- **Objective:** To use AIS information to track vessel traffic and vessel trends within the CINMS, enhancing socioeconomic and scientific research as well as Sanctuary resource protection capabilities.
- **Implementation:** Research and Monitoring, and Resource Protection staff, along with Enforcement partners

### **Background**

AIS systems are currently mandatory for ships over 300 Gross Registered Tons, and in coming years these systems will become more prevalent on smaller ships as well as commercial and recreational boats. AIS systems transmit vessel information using FM frequency radio waves. Information transmitted includes: vessel identification data; location (updated every few seconds while underway); speed; heading; destination; cargo; crew complement; and various other ancillary data.

These data are invaluable for many Sanctuary research and enforcement goals, including:

- Monitoring large vessel (ship) traffic, such as:
  - Traffic activity in the shipping lanes;
  - Types of ships (*e.g.*, cargo, tanker, cruise ships);
  - Cargo types (hazardous vs. non-hazardous); and
  - Monitoring ship activity outside of the shipping lanes
- As AIS becomes more prevalent, monitoring small vessel traffic in the CINMS, such as:
  - Small vessel destinations to pinpoint high use areas;
  - Small vessel points of origin to understand from where users are coming; and
  - Monitoring potential impacts of disabled vessels;
- Enhancing SAMSAP (Strategy CS.1) by providing:
  - Verification data for SAMSAP surveys; and
  - Additional data (*e.g.*, vessel points of origin) not collected by SAMSAP
- With partners, providing acoustic monitoring and marine mammal interaction data:
  - Collect and analyze vessel noise data within and around the CINMS; and
  - Determine whether there are correlations between vessel noise and observed marine mammal activity pattern changes.

### **Activities (4)**

**(1) Work with Partners to Install an AIS Transceiver Station on the Northern Channel Islands.** Also work with the U.S. Navy to integrate the data stream from an existing AIS transceiver on San Nicholas Island.

**Status:** Implement by year 1

**Partners:** Channel Islands National Park, U.S. Navy, Navbase Ventura County; Marine Exchange of Southern California; U.S. Coast Guard

***(2) Work with Partners to Create an Internet Access Point for CINMS to View Realtime AIS Data and to Download Archival Data Based on Specific Information Needs.***

Status: Implement by year 2

Partners: U.S. Navy, Navbase Ventura County; U.S. Coast Guard; Marine Exchange of Southern California; and NOAA NMSP

***(3) Download and Analyze AIS Data to Address Research, Monitoring and Management Needs, as Described Above.***

Status: Implement in years 2-5

Partners: Internal, Scripps Institute of Oceanography

***(4) Work with Scripps Institute of Oceanography to House an AIS Receiver Used to Collect Data on Vessel Traffic as Part of an Ongoing Study of Anthropogenic Noise in the Marine Environment and the Effects on Marine Mammals.*** This activity addresses Sanctuary Advisory Council anthropogenic noise policy and partnerships recommendation 1: Establishment of a vessel traffic-monitoring program to log and quantify vessel traffic through the Sanctuary.

Status: In place, ongoing through year 5

Partners: Scripps Institute of Oceanography

**Table 5. Estimated Costs for the Conservation Science Action Plan**

Strategy	Estimated Annual Cost (in thousands)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
CS.1: SAMSAP	\$30	\$40.5	\$23	\$23	\$23	\$139.50
CS.2: Comprehensive Data Management	\$126	\$126	\$126	\$126	\$126	\$630.00
CS.3: Support Monitoring and Site Characterization Programs	-	\$80	\$80	\$80	\$80	\$320.00
CS.4: Collaborative Marine Research Project**	-	\$50	\$50	\$50	\$50	\$200.00
CS.5: Research Interpretation**	-	\$42	\$32	\$32	\$32	\$138.00
CS.6: Biological Monitoring of MPA Network*** <sup>1</sup>	\$1,510	\$1,510	\$1,510	\$1,510	\$1,510	\$7,550.00
CS.7: Socioeconomic Monitoring of MPA Network**	\$285	\$285	\$285	\$285	\$285	\$1,425.00
CS.8: Automated Identification System (AIS) Vessel Tracking**	-	\$105	\$30	\$30	\$34	\$199.00
<b>Total Estimated Annual Cost</b>	<b>\$1,951.00</b>	<b>\$2,238.5</b>	<b>\$2,136.00</b>	<b>\$2,136.00</b>	<b>\$2,140.00</b>	<b>\$10,601.50</b>

\* Cost estimates exclude base budget funding requirements (salaries, overhead, etc.).

\*\* Contributions from outside funding sources also anticipated.

<sup>1</sup> The substantially high costs of deep water MPA monitoring are reflected here.

## Addressing the Issues – Strategies From Other Action Plans

In addition to the strategies identified in this Conservation Science Action Plan, there are other strategies from other action plans directly or indirectly addressing the issues associated with conservation science, such as:

- WQ.1 – Offshore Water Quality Monitoring;
- MH.1 – The Shipwreck Reconnaissance Program;
- RP.1 – Identifying & Assessing Current and Emerging Issues;
- RP.2 – Responding to Identified Issues; and
- OP.8 – Greening Facilities & Operations

## Addressing the Issues – Regulations

Not applicable. There are no Sanctuary regulations associated with the issues in the Conservation Science Action Plan. Sanctuary regulations are available at 15 CFR 922.70-922.74.